Discovering the Past Using the Future: Remote Sensing and the Lost City of Ubar

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(adapted from lesson plan by Christopher Freeman, Mississippi Gulf Coast Community College)

Classroom sessions/estimated time: Three Class Periods, 50 minutes each

Grade Level(s): 9-12

Purpose: To explore the impact of remote sensing as it relates to the discovery of the Lost City of Arabia

Geography Standards addressed:
National Geography Standards addressed:
Essential Element 1: the World in Spatial Terms
Standard 1: How to use maps and other geographic representations, tools and technologies to acquire, process, and report information from a special perspective
Essential Element 6: the Uses of Geography
Standard 17: How to apply geography to interpret the past

Indiana Geography Standards addressed:
Standard 1: The World in Spatial Terms
Students will use maps, globes, atlases, and grid-reference technologies, such as remote sensing, GIS, and GPS to acquire and process information about people, places, and environments.
Standard 2: Places and Regions
Students will acquire a framework for thinking geographically, including the location and unique characteristics of places, They will identify the physical and human characteristics of place.
Standard 6: The Uses of Geography
Students will understand the influence of physical and human geographic factors on the evolution of significant historic events and movements. They will apply the geographic viewpoint to local, regional, and world policies and problems.

Objectives:

- Students will identify and locate specific locations on the Arabian Peninsula, the Rub al Khali Desert, and present day Oman.
- Students will identify other names for the lost city of Arabia as Ubar, the Atlantis of the Sands, Iram, and the city of towers.
- Students will identify the impact of remote sensing on the discovery of the lost city of Arabia
- Students will identify specific remote sensing tools utilized.
- Students will identify and explain the collaboration between remote sensing scientists and archeologists as the basis for this discovery.

Background:
The lost city of Arabia, also known as Ubar, the Atlantis of the Sands, Iram, and the city of towers, is located on the Arabian Peninsula (now known as Oman). The lost city of

Arabia became rich by trading in frankincense, which was used as a fragrance, for medical purposes, and for embalming. Prepared from the sap or gum of trees grown in nearby regions, this sweet-smelling incense was as valuable as gold at the time. Legend says that Allah destroyed the city and blotted out the roads leading to it because of the wickedness that flourished there. Lost for more than a thousand years, the city mentioned in the Holy Quran was thought to be a legend until the early 1990's. People were astonished to read headlines declaring that a filmmaker and amateur archeologists, Nicholas Clapp, together with NASA scientist Dr. Ronald Blom, and a team of explorers had actually discovered this city of mysteries.
This lesson plan focuses on the role of remote sensing and the collaboration between archaeologists and NASA scientists in the discovery.

Materials Required:

- Computer with internet access
- One bag of sand
- A tiny piece of metal to put in the sand
- Bar magnets
- Video: Lost City of Arabia, optional (available from NOVA)
- Three Web Site Study Guides (provided)
- Map Exercise (provided)
- Outline map of Arabian Peninsula

Procedures:

Day 1

Introduction: Since most students will associate The Lost City of Arabia with the magic of Aladdin and flying carpets, allow a day for them to research background information. Provide students with the following websites for their investigations and a corresponding study guide for them to complete for each web site.
Student Worksheet #1- http://www.islam101.com/archeology/ubar.html
Student Worksheet # 2- http://www.pbs.org/wgbh/nova/ubar/tools/index.html
Student Worksheet #3- http://www.pbs.org/wgbh/nova/ubar/tools/tools2.html

Day 2

Some students may need additional time to complete the research from the preceding day. Allow time for class discussion and to discuss any problems they are having finding the material. After the students have some background information on the lost city of Arabia (both through research and teacher presentation), ask the question "How was this city, which was lost for thousands of years, discovered?"

To demonstrate the difficulty in locating the lost city, pour a bag of sand containing one pellet of metal into an oblong container. Explain to the students that there is a small pellet of metal (metal shavings will work also) located within the sand. Allow several students to try to find the metal. (This will be a daunting task!) Keep the sand in the classroom for the students to continue exploring. It will also be used on the last day of the lesson.

Relate the activity to the great difficulty archeologists faced in trying to discover a

legendary city in miles and miles of sand dunes, which reached 1000 feet in height in some areas. Open website http://courses.smsu.edu/ejm893f/creative/glg110/deserts-wind.html#backstardune. Click on the photographs to enlarge them.

After discussing the lack of landmarks within the photographs, probe students regarding shifting of locations due to weather conditions. Lead them to discover that the shifting of the sand makes it nearly impossible to pinpoint specific locations for later use.

Activity : (This is a computer simulation that informs about tools needed to find out where they are.)

This could be done by individual students assigned to computers or does as a class using a projector system. Open website http://www.pbs.org/wgbh/nova/ubar/hotscienceubar/index.html. This website asks students to imagine that they are archeologists looking for the lost city of Arabia. Their first task is to locate the Rub al Khali Desert by clicking on its location on a world map. A wrong click identifies the desert that they have found and also gives directions (Try heading southwest.) for locating the Rub al Khali. When the students click on the correct location, they are given factual information on the Arabian Desert and presented with the task of selecting items they will need to help them figure out where they are. As students select three of the six items (teddy bear, map, compass, fire, whistle, and global positioning system receiver) an explanation on the items usefulness is given.

Day 3

Conclusion: Class discussion of focus question "What role did remote sensing play in the discovery of the lost city of Arabia?". Emphasize the collaboration between archeologists and scientists who utilize remote sensing as the major reason the lost city of Arabia was located. (Findings that should be identified include locating distinct tracks through the desert, which were identified as old caravan routes, the imagery allowed the archeologists to look at a large area in a single scene further allowing them to analyze vast portions of the desert at one time, using image processing techniques to highlight important features and data from different sources allowed them to exclude large regions of the desert and narrow the search to the most promising sites. Types of remote sensing identified should include radar imaging, Landsat imagery, and Thematic Mapper. To demonstrate the usefulness of remote sensing, provide students with a bar magnet and ask them to find the pellet of metal (or metal shavings) in the sand. This may take a few minutes but is a much, more efficient way of locating the metal. Relate this to remote sensing's ability to help archeologist become more efficient in their quest to uncover the past.

Assessment: (100 points possible)

1. Completed Study Guides (10 points each= 30 points)
2. Completed Map (20 points)
3. Written response to the open-ended focus question: “What role did remote sensing play in the discovery of the lost city of Arabia?” (50 points)

Extensions: If time permits, view the Nova video Lost City of Arabia.

Remote Sensing and the Lost City of Ubar
Student Worksheet # 1

Investigate the following website: http://www.islam101.com/archeology/ubar.html and complete the following questions:

1. List three names used for the lost city of Ubar.

a.

b.

c.

2. According to researchers what might have been the early purpose of this city's location?

3. Describe what the researchers found in 1992.

4. Was this the first effort to find Ubar? Explain.

Remote Sensing and the Lost City of Ubar
Student Worksheet # 2

Investigate the following website: www.pbs.org/wgbh/nova/ubar/tools/index.html and complete the following questions.

1. List and describe two types of ground devices

2. Why can't the human eye detect differences in rocks and terrain?

3. Name and describe the capability of the first multispectral imaging satellite in 1972.

4. Name and describe the imaging system launched in 1981.

5. What information was revealed about the Sahara Desert as a result of the SIR-A technology?

Remote Sensing and the Lost City of Ubar
Student Worksheet # 3

Investigate the following website: http://www.pbs.org/wgbh/nova/ubar/tools/tools2.html and complete the following questions:

1. How far can the SIR-A technology penetrate?

2. What is the best type of material for this radar to penetrate?

3. How many Landsat satellites are now orbiting the earth?

4. What is a Thematic Mapper?

5. What was noticeable about the surface material of the trail leading to Ubar?

6. What is the difference in SIR-A and SIR-C which was used in 1994?

7. What two other historical sites did researchers gain more knowledge of through radar imaging?

8. What other components were needed to complete archeological research such as identifying the location of Ubar?

Remote Sensing and the Lost City of Ubar Map Exercise

Using the map on the website www.pbs.org/wgbh/nova/ubar/map/index.html locate the following places on the blank map provided.

Countries	**Bodies of Water**	**Cities**
Yemen	Persian Gulf	Riyadh
Oman	Arabian Sea	Mecca
United Arab Emirates	Indian Ocean	Sanaa
Kuwait	Gulf of Aden	Muscat
Qatar	Red Sea	
Jordan		
Iraq		

Also locate the region known as the Empty Quarter and the lost city, Ubar